Observations on global trends in academic research (and how top research institutions can manage these)

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University of Stellenbosch, South Africa

JC Heyneke, Director of Strategy & Business Development, Elsevier S&T Sales

Introduction

- Responsible for **global strategy and business development of our sales groups** in Elsevier Science & Technology

  - ~30,000 customers in ~150 countries
  - all research universities in the world, most of the top R&D companies, thousands of professionals (e.g. buying our books through Amazon)
  - we publish 40% of all research output in South Africa

- I will focus on **trends in research output**
  - what we see in publications (with all publishers)
  - what we hear from universities

- Tony will focus on **trends in publishing** (e.g. Open Access, new article formats)

As a science information company, we have a unique vantage point on science

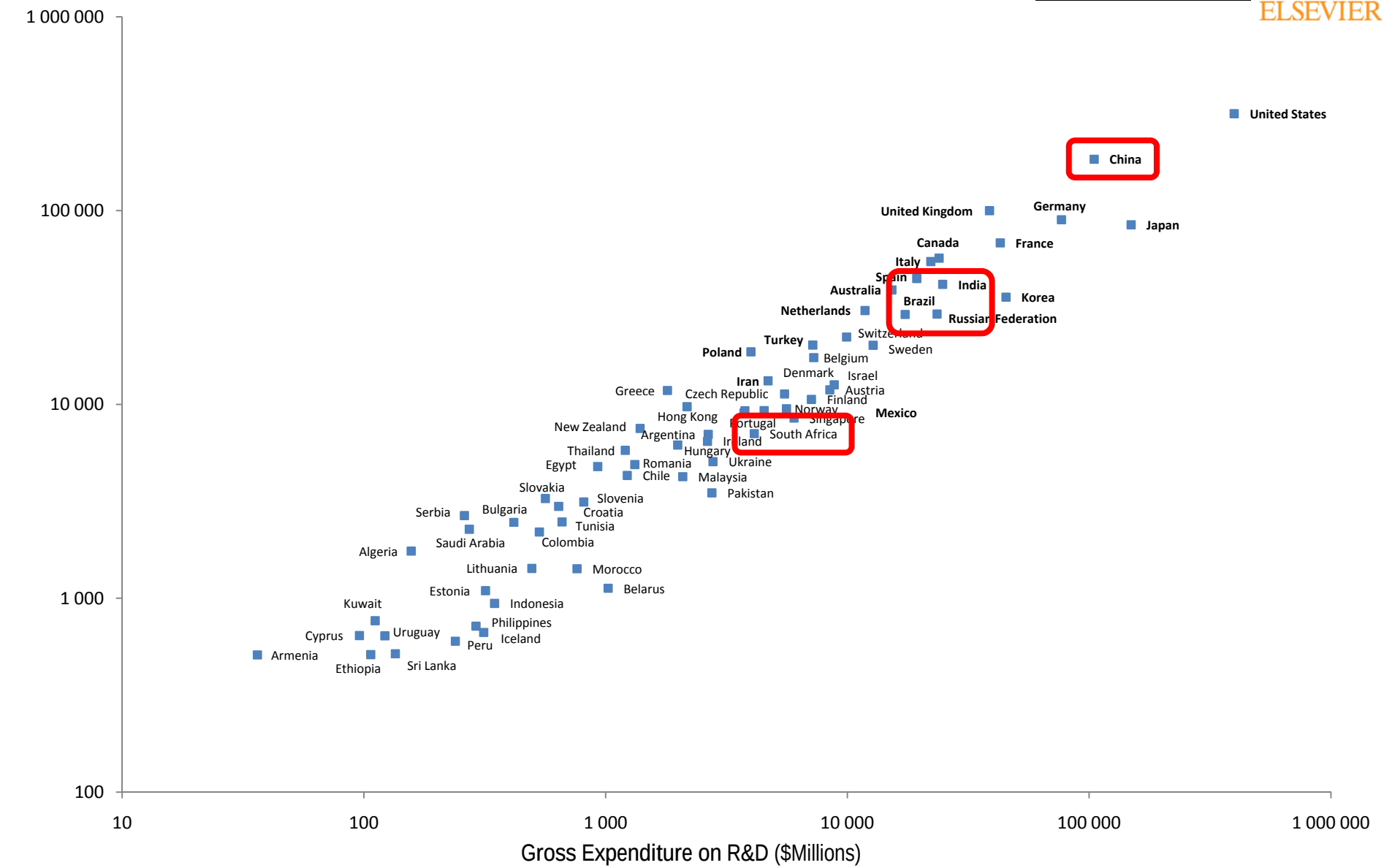
Each year we see (as an industry): 3 million articles submitted, 1.5 million articles published, 30 million readers, 2 billion article downloads, 30 million article citations

As Elsevier, we speak to every research university in the world – to their librarians, faculty, students and increasingly their management (we have spoken to >500 university research executives in the past 12 months)

What do we hear?

Three messages

R&D funding vs. outputs



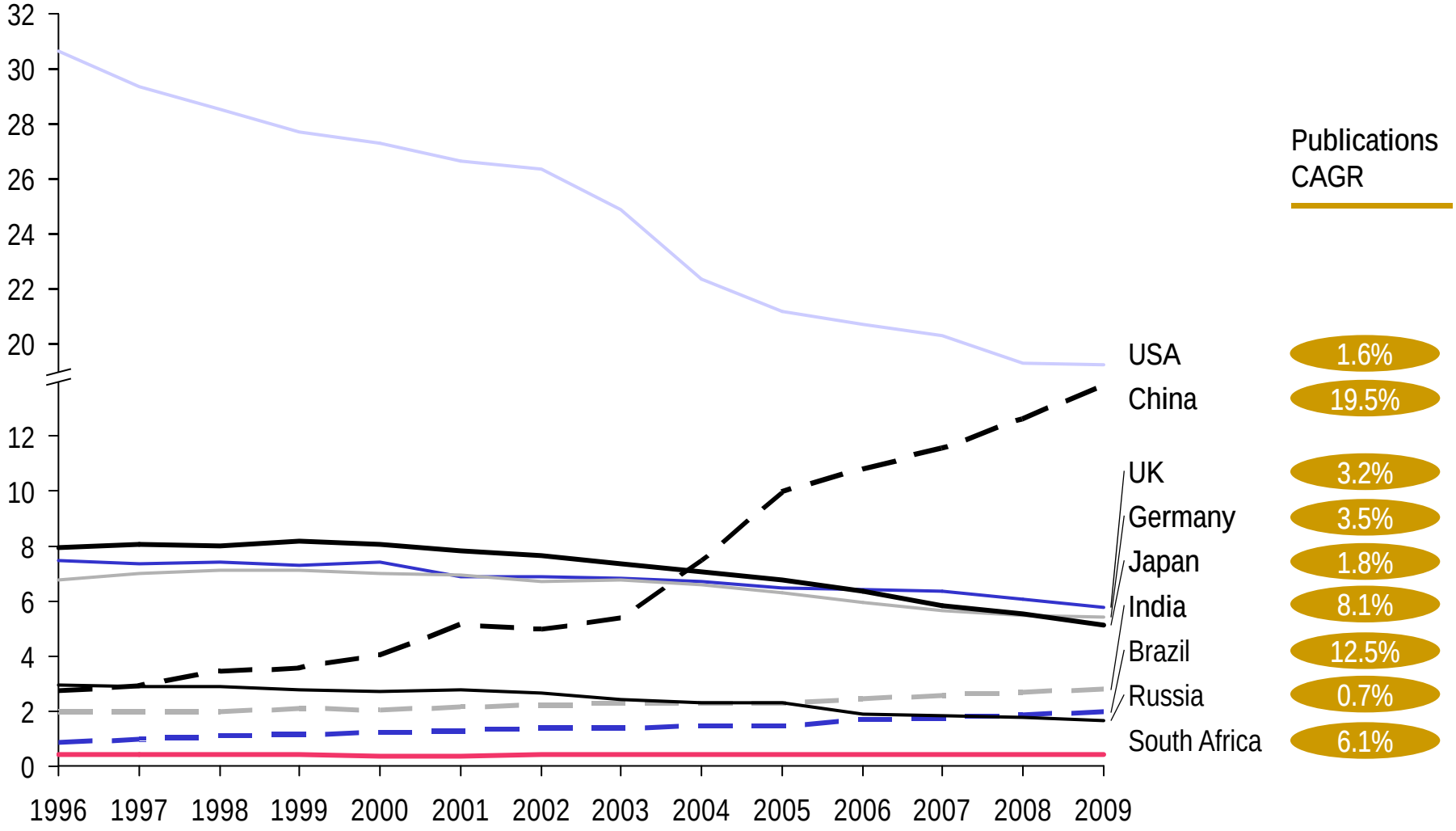
Global R&D spending

- China: 1.5% of GDP (increasing by 20% per year; stated goal of 2.5% of GDP by 2020)
- India: 1.4% of GDP (stated goal of 2.5% of GDP by 2022)
- Sub-Saharan Africa: 0.5% of GDP (stated goal of 1% of GDP by 2010)
- South Africa: 0.9% of GDP

Country share of global published journal articles

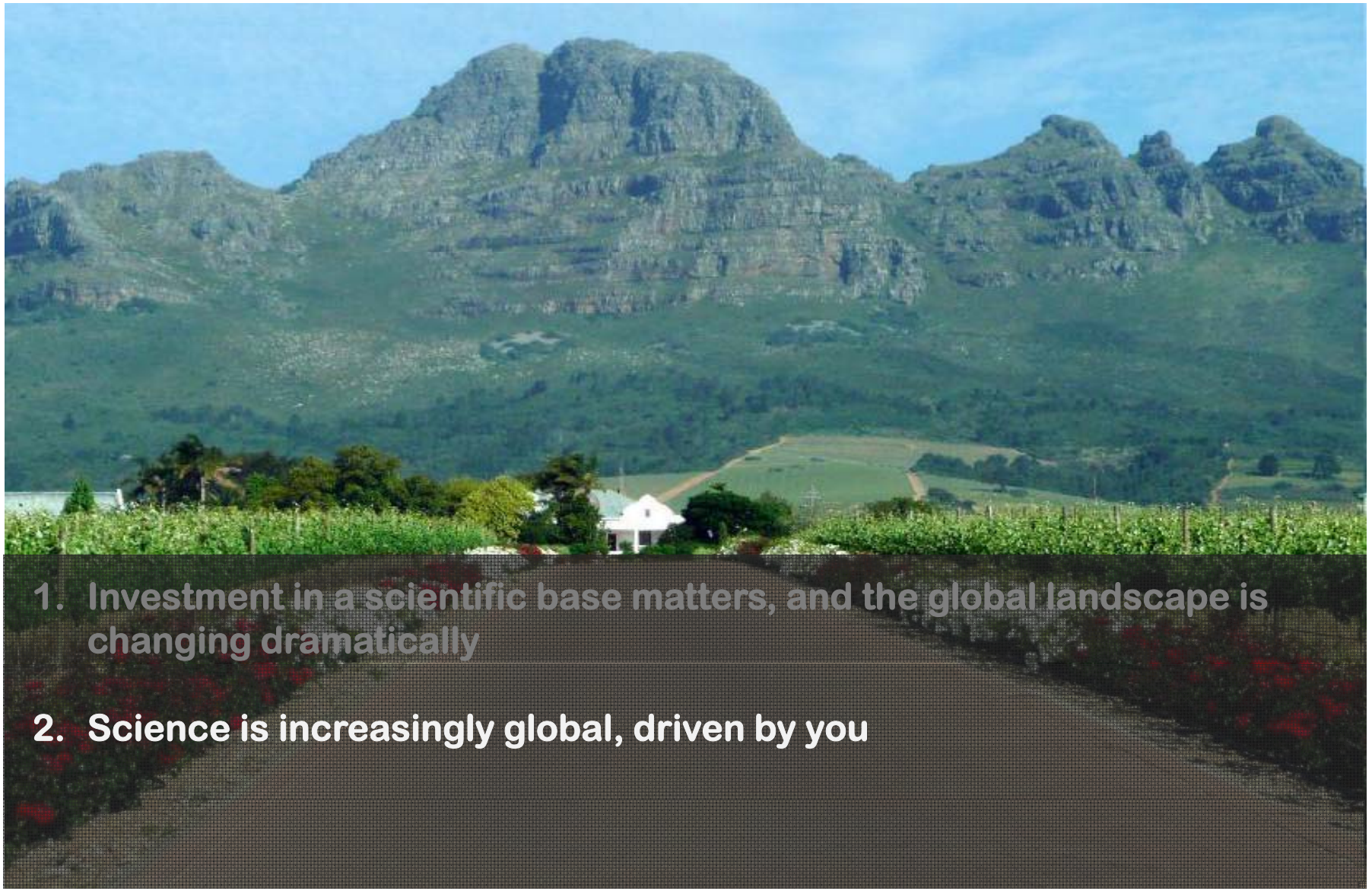
Share of total global articles published
(annual increase in total number of articles of 5.3%) (percent)

(Bold indicates in global top 10)



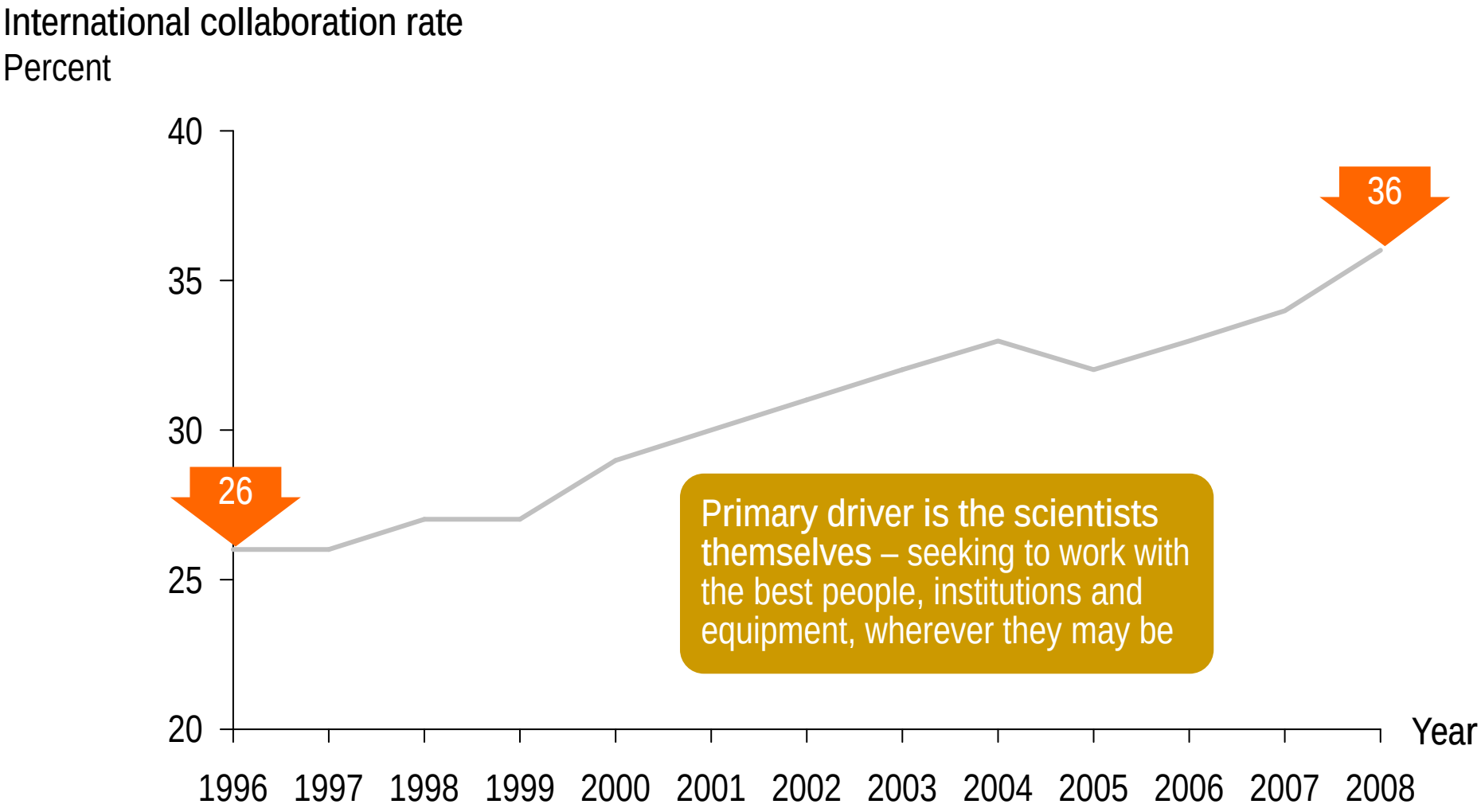
Source: Scopus

Three messages



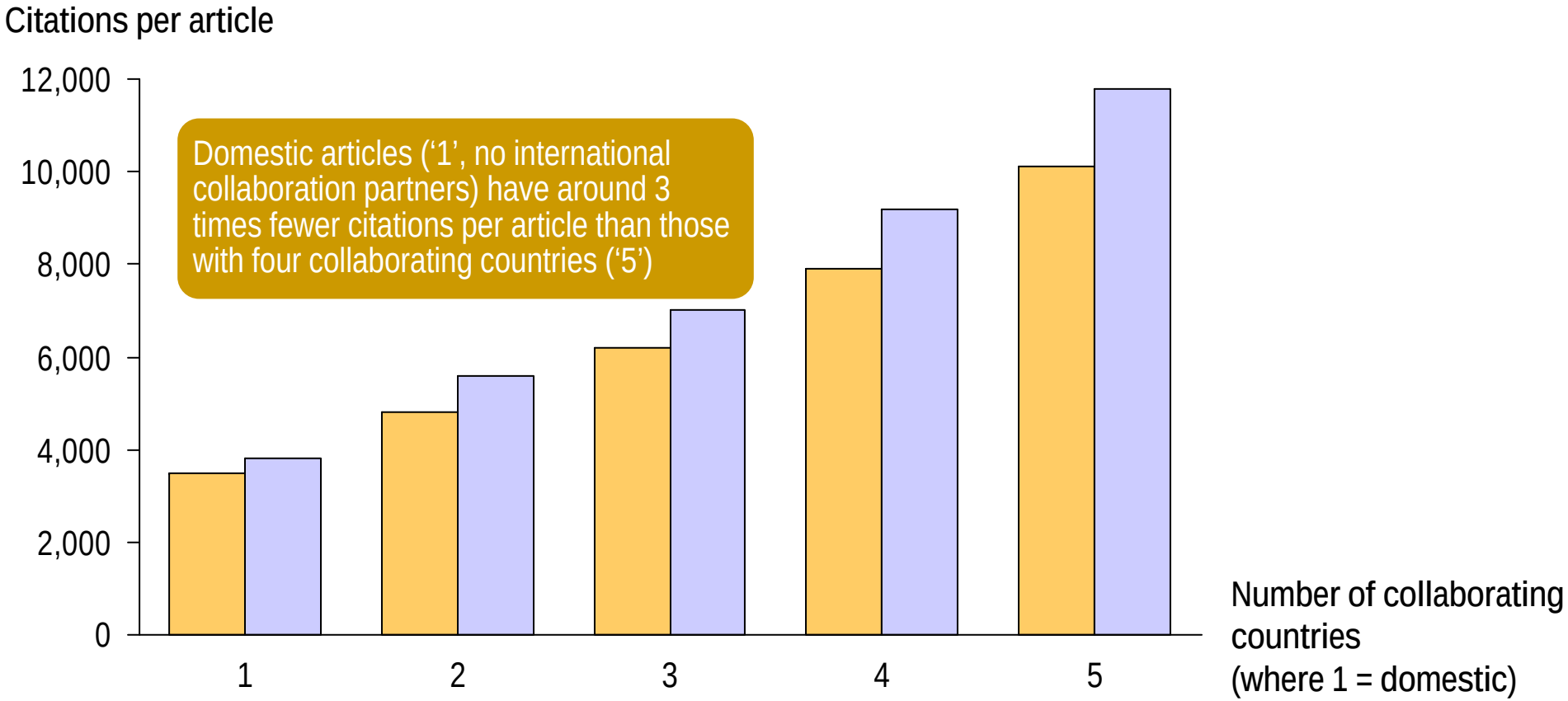
1. Investment in a scientific base matters, and the global landscape is changing dramatically
2. Science is increasingly global, driven by you

International collaboration is increasing rapidly



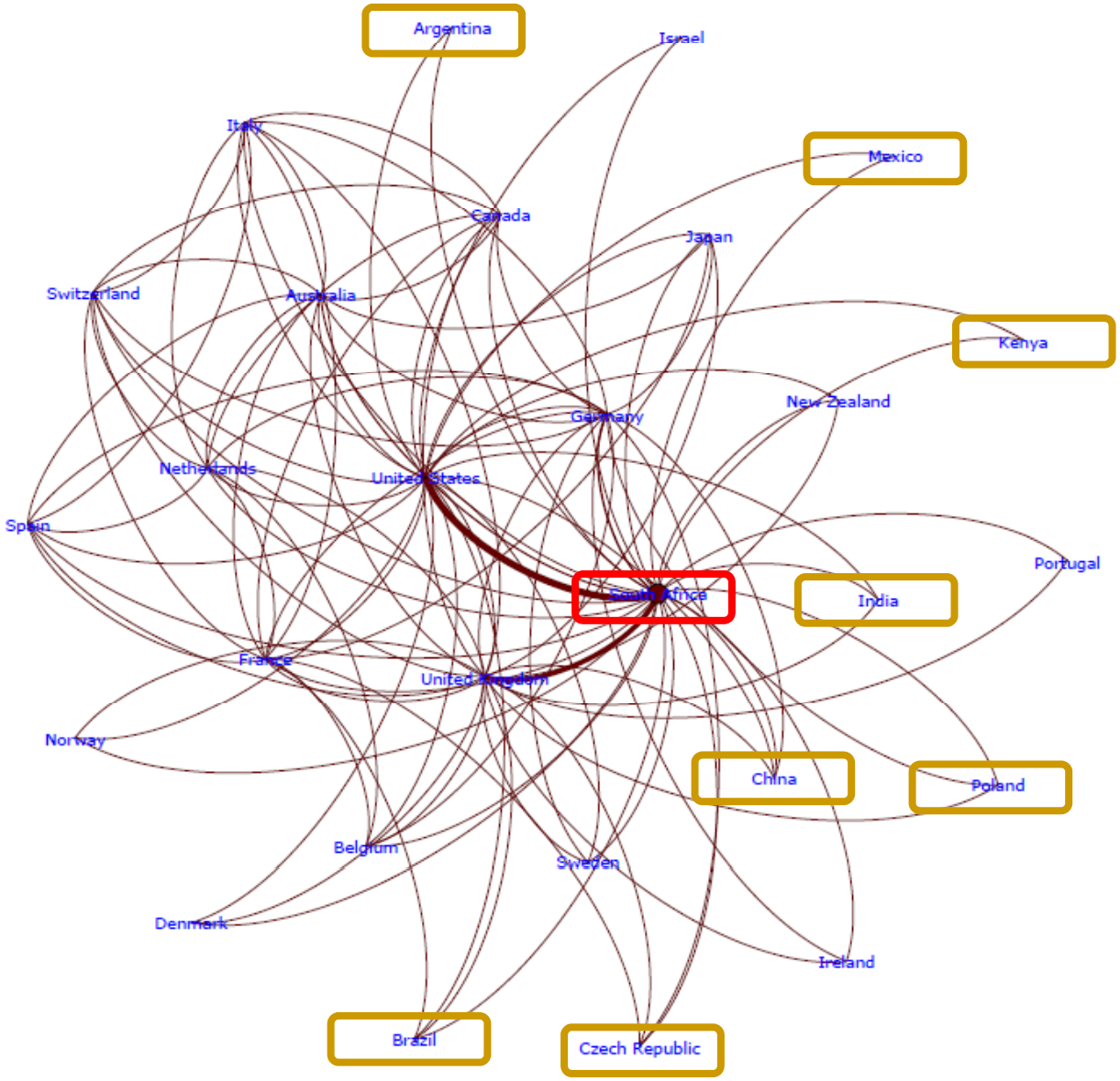
Source: Scopus

International collaboration correlates strongly with publication impact



Source: Scopus

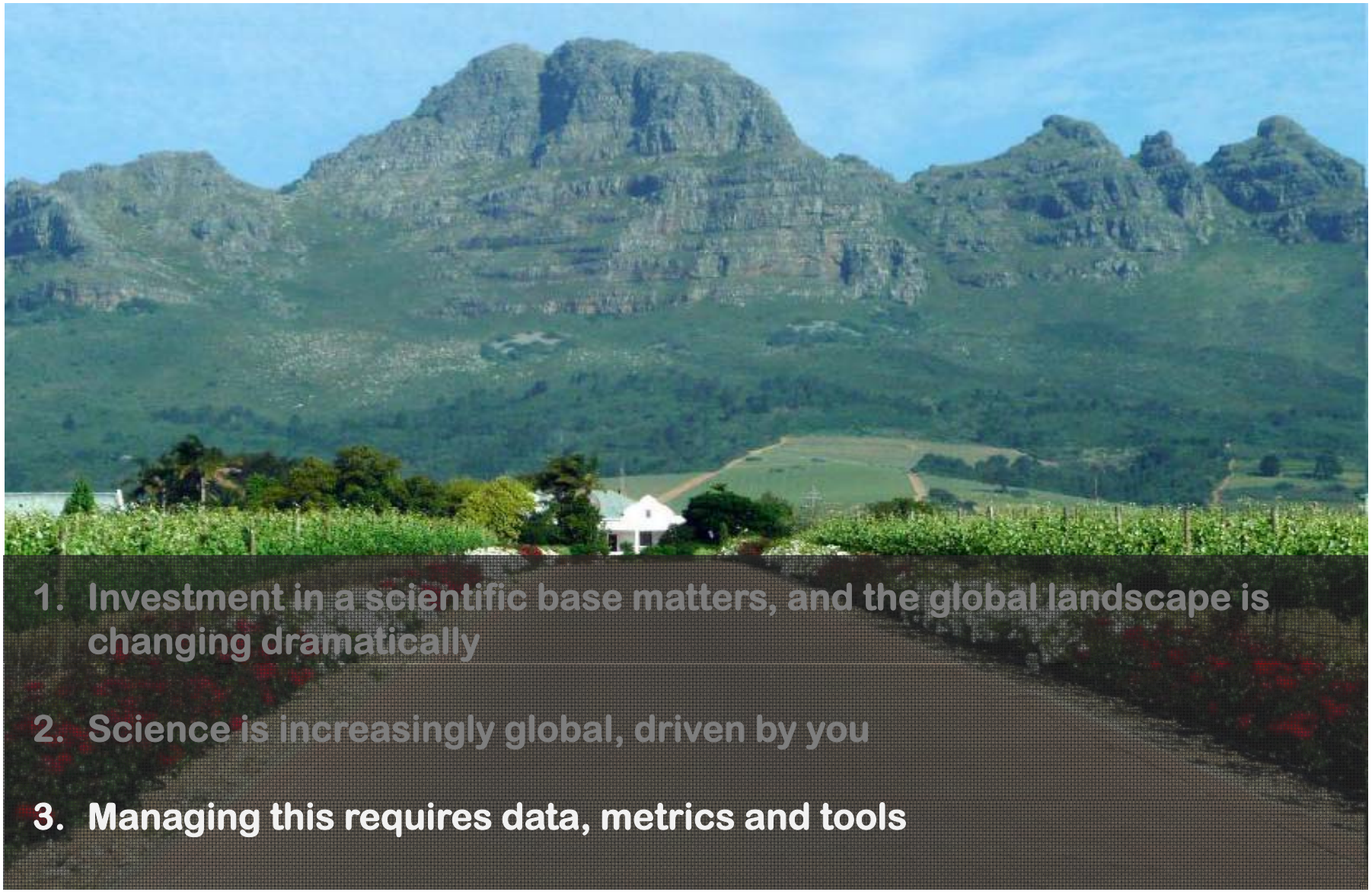
South African research collaboration map



Note: Collaboration relationships are shown for papers authored by South African researchers counted in a 5-year window 2005-09 and are represented as variable-thickness lines (edges) between nodes. Line thickness represents the share of collaboration to or from the connected . Visualisation is by the Force Atlas algorithm, which treats the network of edges as a system of interconnected springs and seeks to satisfy the tension of all edges simultaneously in a 2D rendering; hence, countries sharing a collaborative relationship tend to group together, while those that do not are placed further apart.

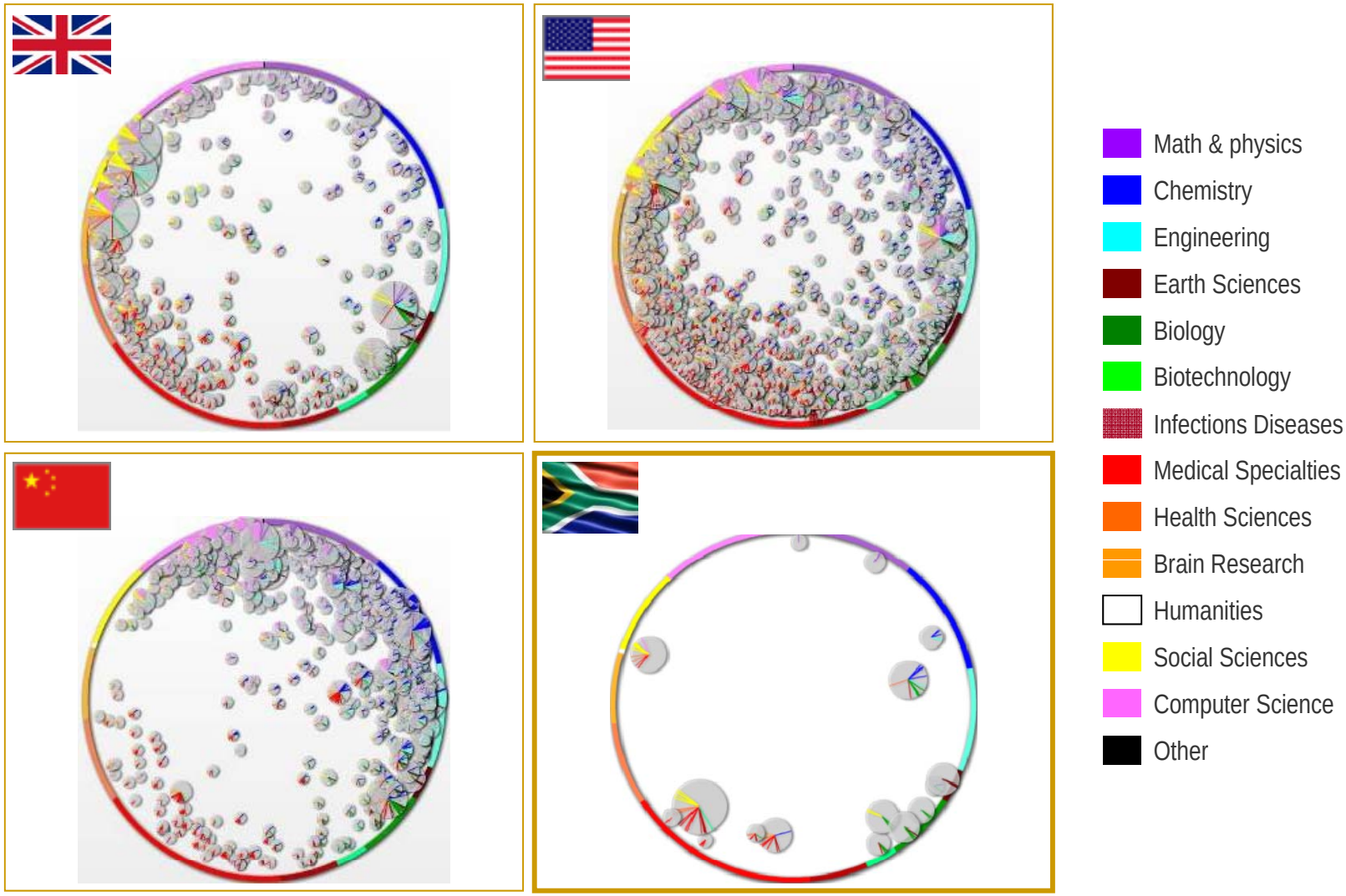
Source: Scopus

Three messages



1. Investment in a scientific base matters, and the global landscape is changing dramatically
2. Science is increasingly global, driven by you
3. **Managing this requires data, metrics and tools**

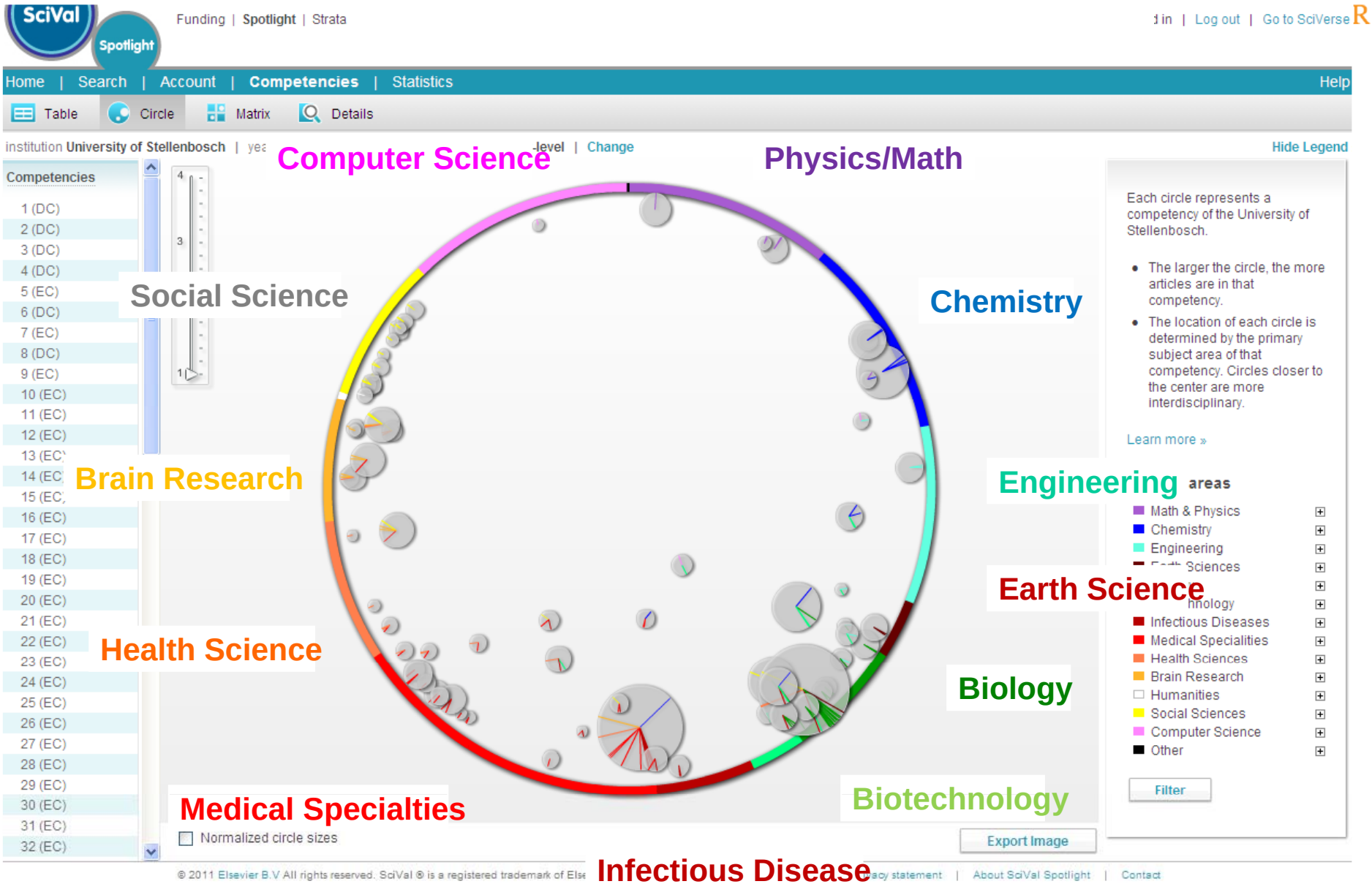
Tools to map national strengths to focus and co-ordinate R&D investments (country level – South Africa - 16 strengths)



Note: Each small circle represents a strength; all color strips within the circle refer to the specific disciplines composing the strength. Multi-disciplinary strengths are pulling towards the centre of the Wheel of Science

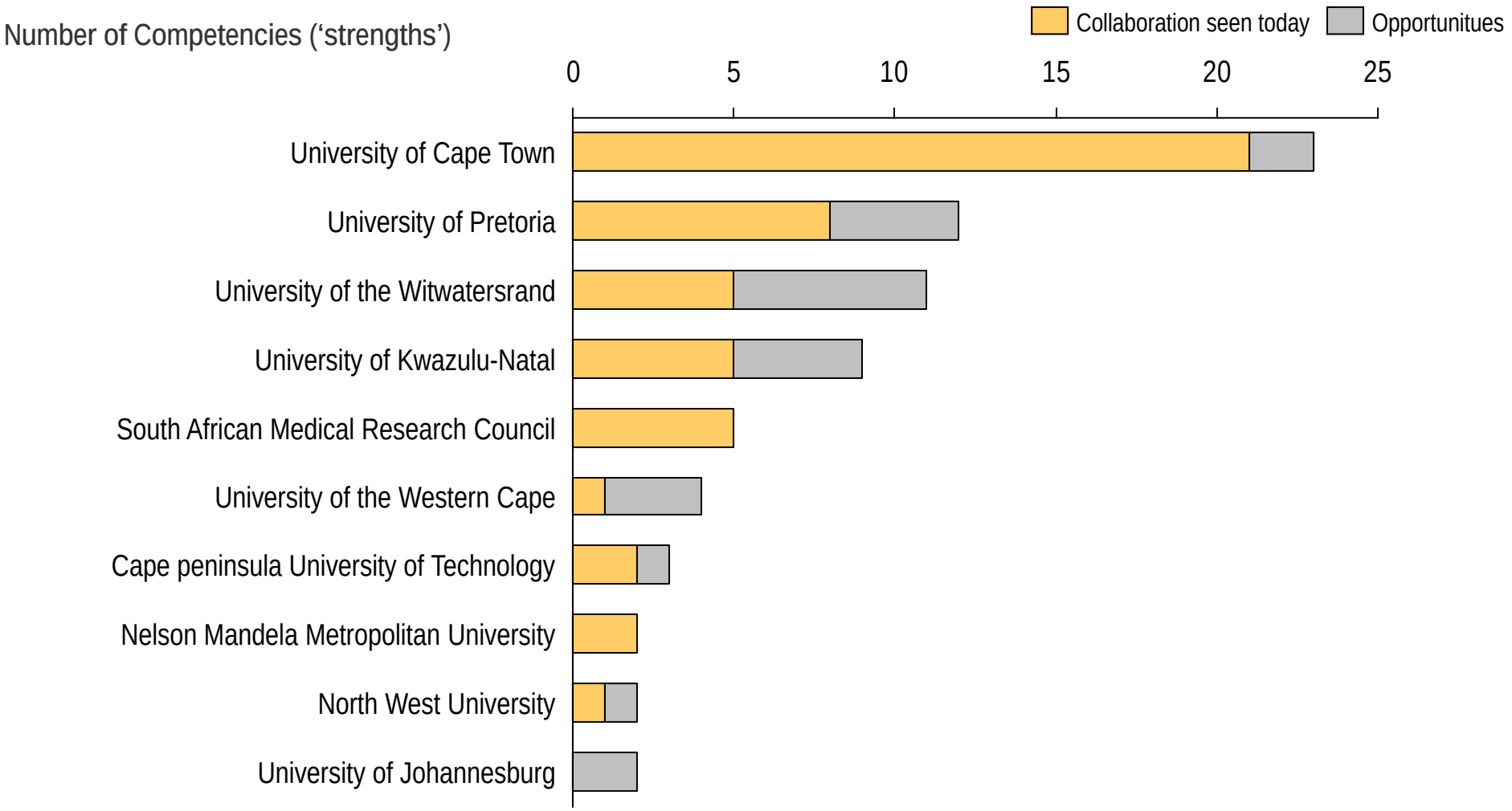
Source: SciVal Spotlight

Tools to map national strengths to focus and co-ordinate R&D investments (university level – Stellenbosch – 75 strengths)



Source: *SciVal Spotlight*

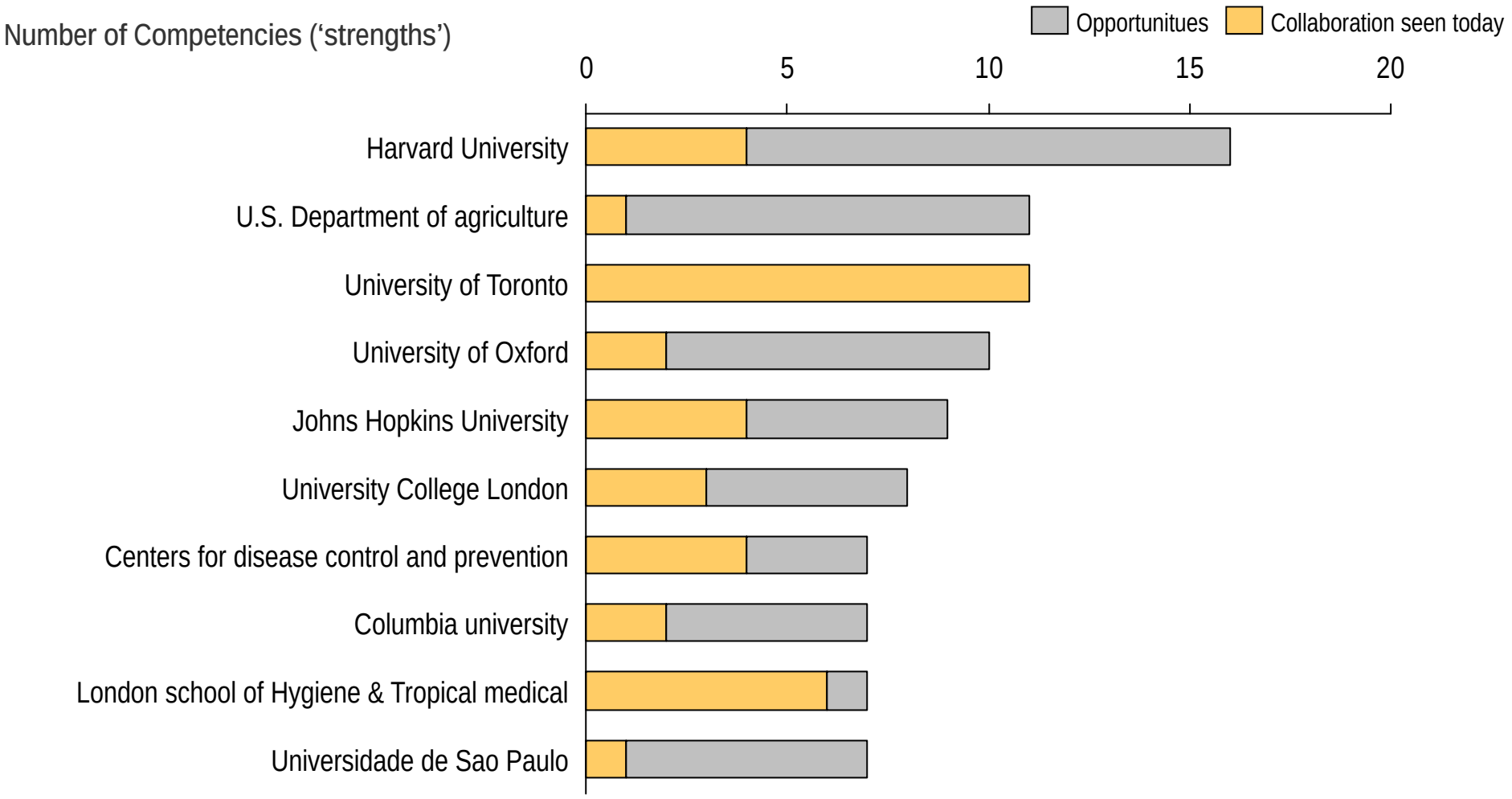
How extensively does Stellenbosch collaborate domestically within these strengths?



Domestic collaboration rate within overlapping strengths is 60%

Source: SciVal Spotlight

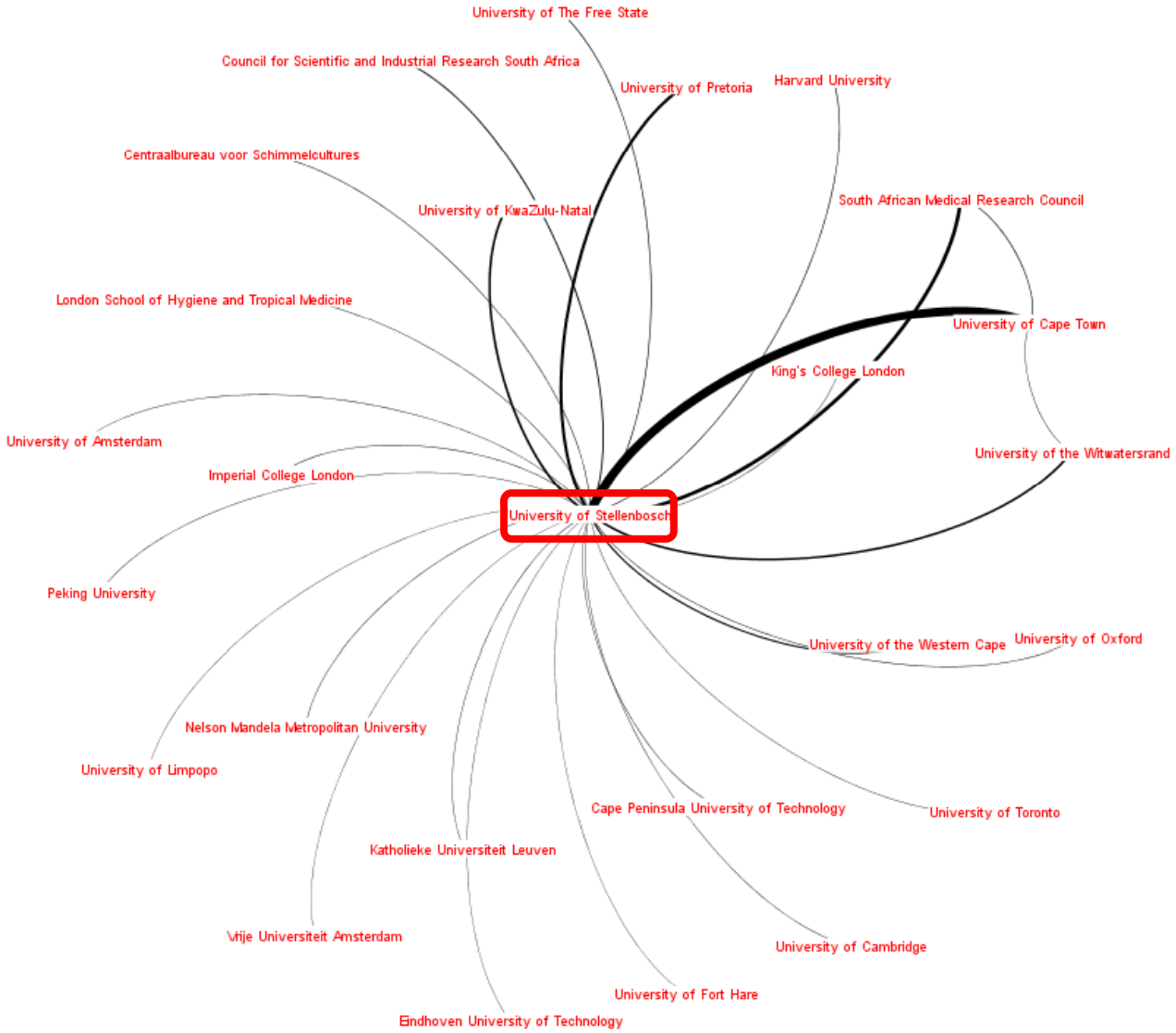
How extensively does Stellenbosch collaborate internationally within these strengths?



International collaboration rate within overlapping strengths is 32%

Source: SciVal Spotlight

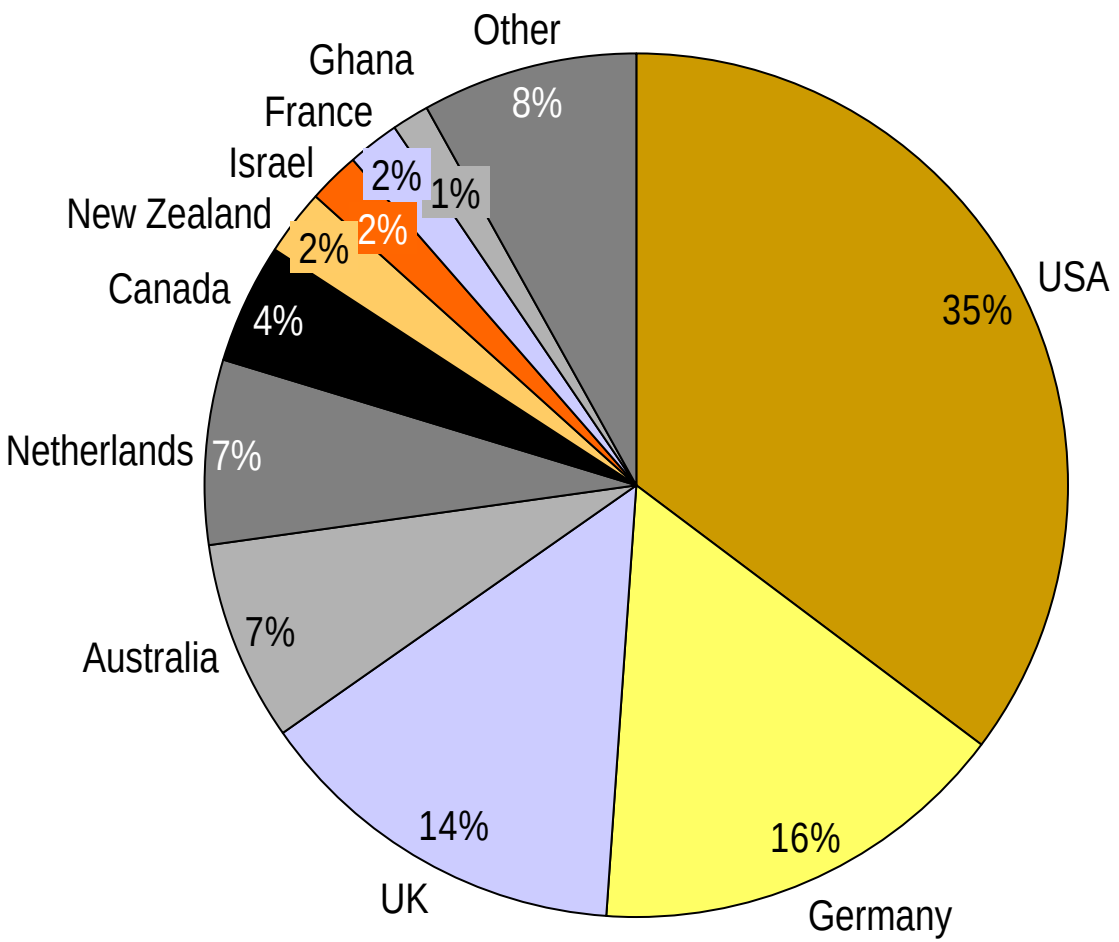
Tools to map collaboration networks to strengthen existing ones and identify new opportunities (Stellenbosch)



Source: Scopus

Tools to manage the natural networks – The Scientific Diaspora (South Africa)

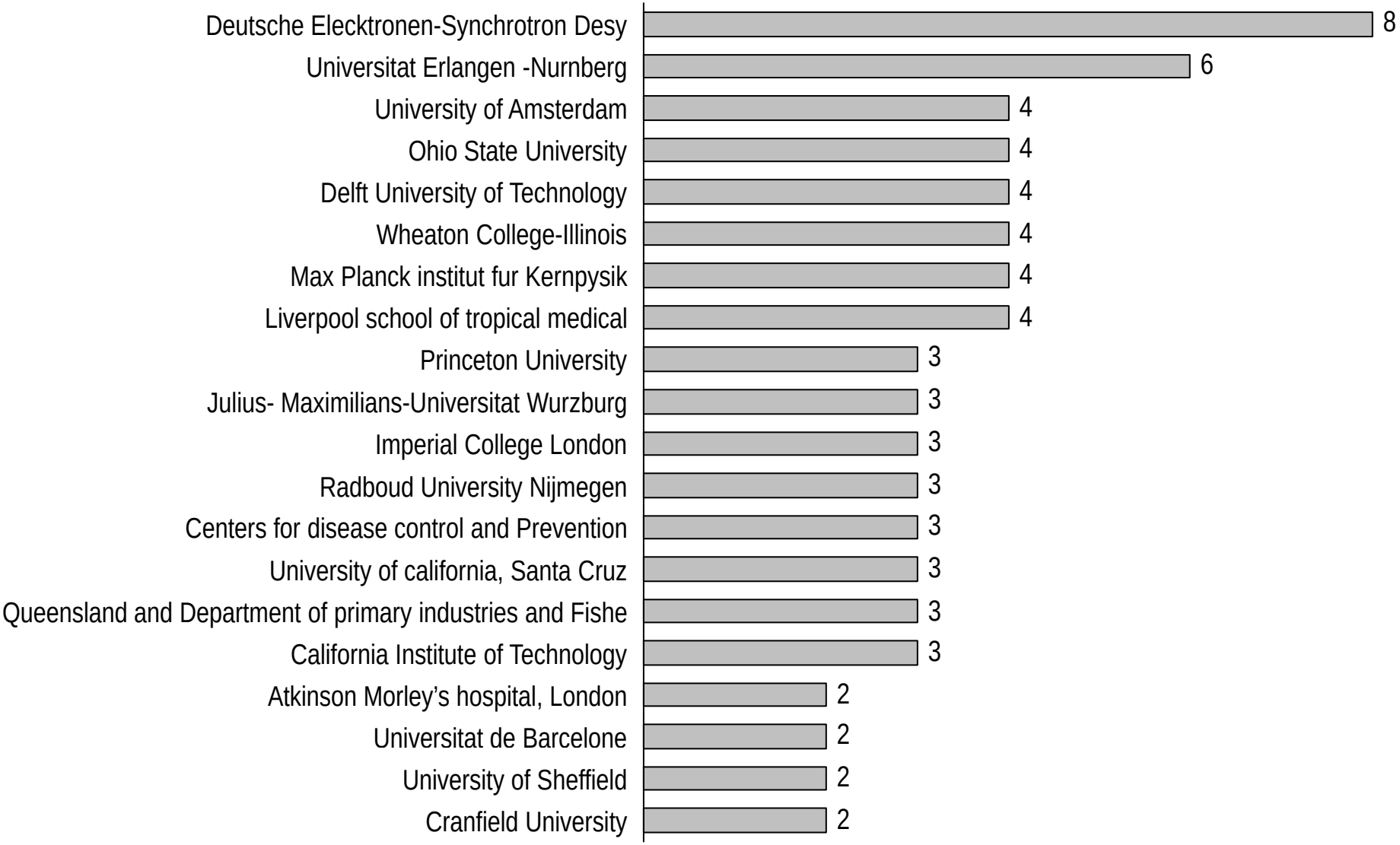
Top countries importing "South African" scientists (based on publications)



Source: Scopus

Where do they go?

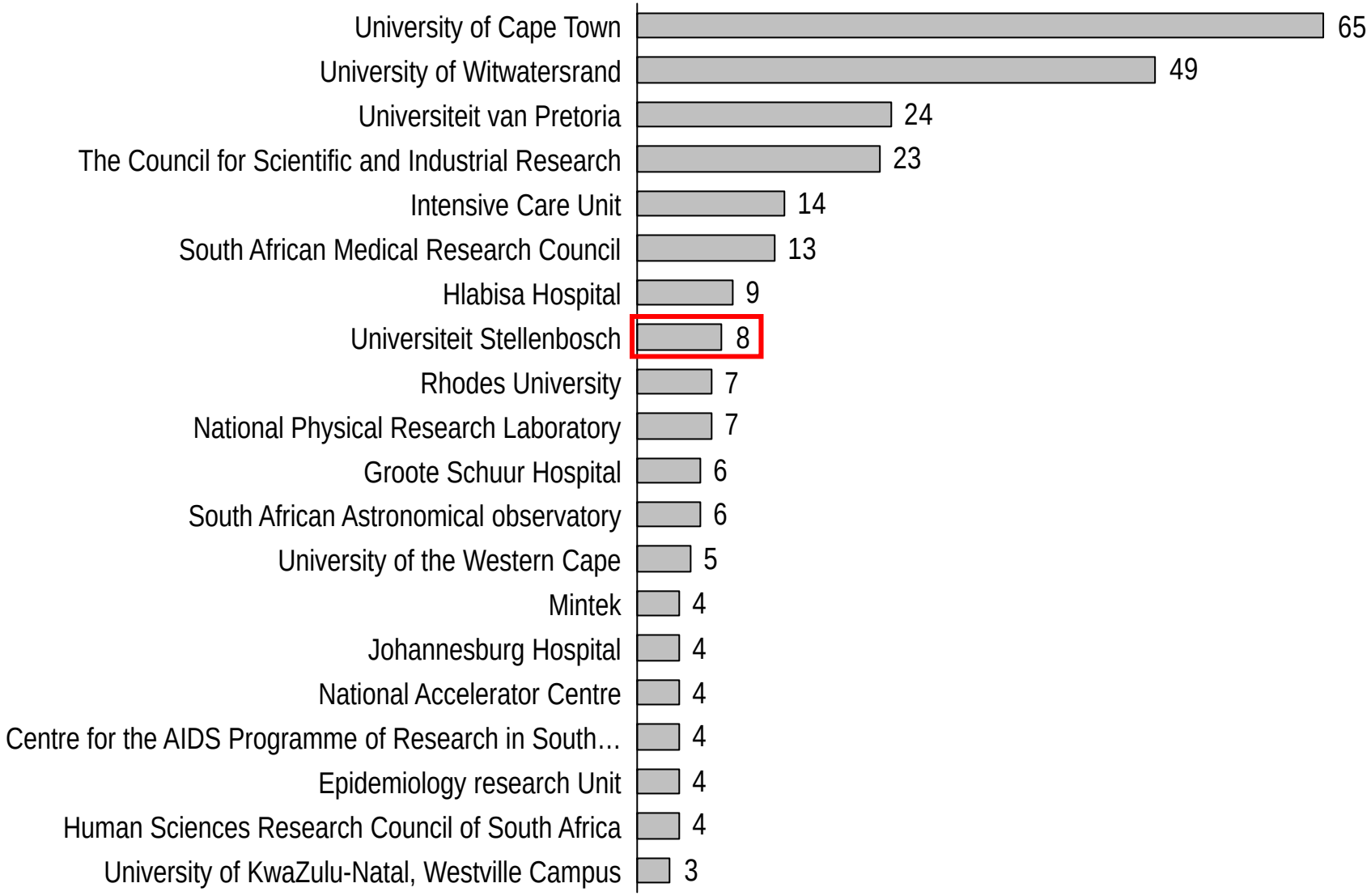
Importing Institutions: All subject Areas – Researchers



Source: Scopus

Which institutes did they come from?

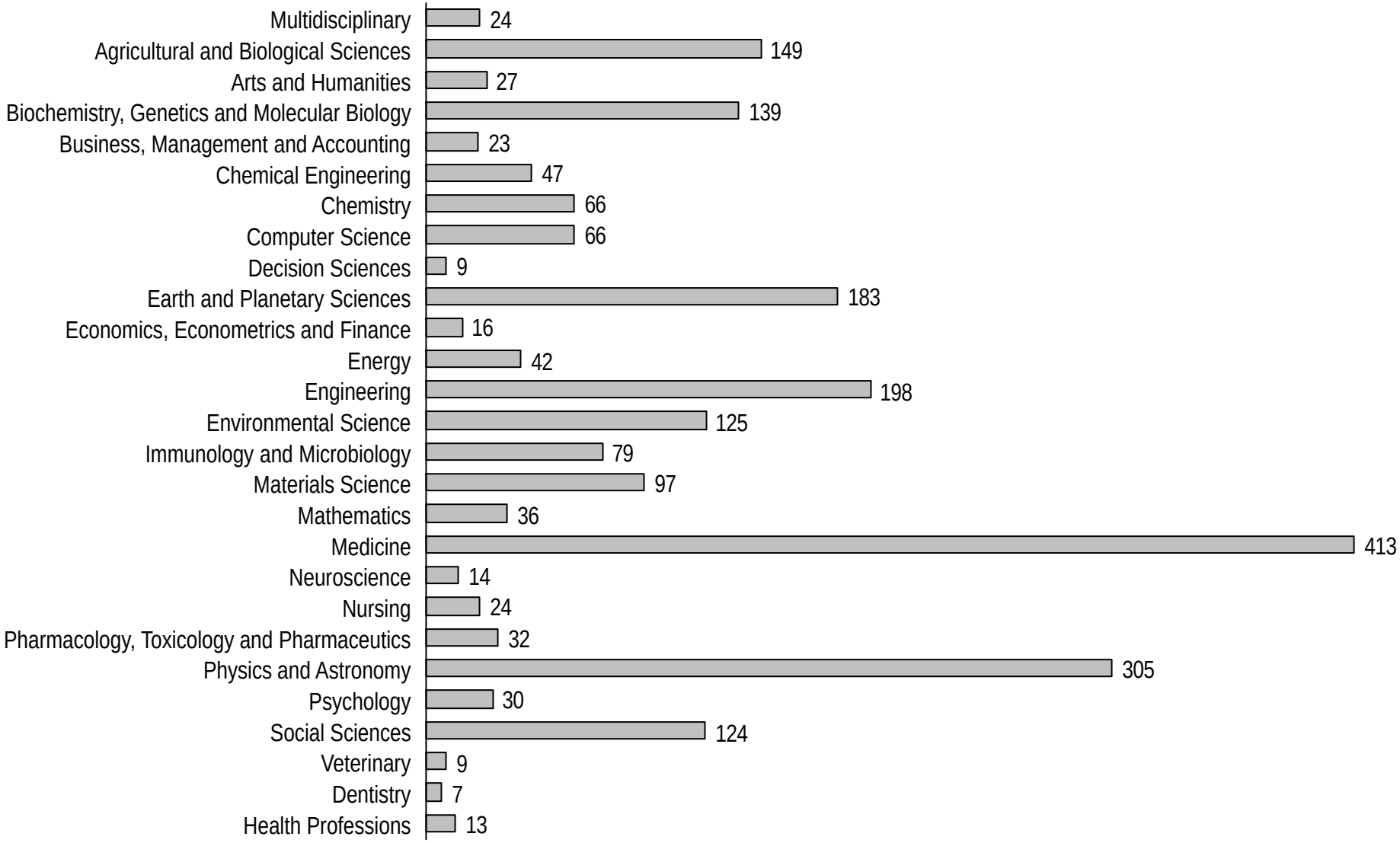
Exporting Institutions – Research



Source: Scopus

What fields are they active in?

Brain Drain Per subject area – Research



Source: Scopus

Who are they?

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Surname	First name	Publications	Citations	H-index	Importing Inst.	Country	Exporting Inst.
Lockman	W. S.	293	2625	25	Santa Cruz Institute for Partical Physics	usa	University of Cape Town
Cowan	R. F.	276	2188	24	University of Maryland	usa	University of Cape Town
Porter	F. C.	270	2087	23	California Institute of Technology	usa	University of Cape Town
Williams	D. C.	151	2846	26	University of California, Santa Cruz	usa	University of Cape Town
Nagai	Kotobu	131	1109	20	National Institute for Materials Science Tsukuba	jpn	Materials Research Group
Spencer	Kirk T.	111	3267	24	University of Chicago	usa	University of Witwatersrand
Goldblatt	Jack	83	2283	23	Telethon Institute for Child Health Research	aus	Red Cross War Memorial Children's Hospital
Linares	Josefina F.	81	2399	28	Universitat de Barcelona	esp	University of Witwatersrand
Woltersdorf	Jorg	79	991	19	Max-Planck-Institute of Microstructure Physics	deu	Universiteit van Pretoria
Ressel	Peter	77	360	10	Ferdinand-Braun-Institut für Hochstfrequenztechr	deu	Universiteit van Pretoria
Garnovskii	Dmitry A.	73	522	14	Russian Academy of Sciences	rus	University of Fort Hare
BYASS	PETER	72	891	17	University of Aberdeen	gbr	South African Medical Research Council
Halicz	Ludwik	65	1527	25	Geological Survey of Israel	isr	Mintek
Marlow	D. R.	62	1672	24	Princeton University	usa	University of Cape Town
Goodman	Carmel	58	1280	21	Australian Institute of Sport	aus	University of the Witwatersrand, Faculty of Health Sciences,
Pallares	Roman	56	1494	20	Universitat de Barcelona	esp	University of Witwatersrand
Turnbull	Oliver H.	54	601	14	Bangor University	gbr	University of Witwatersrand
Traub	Lance W.	54	171	8	Embry Riddle Aeronautical University, Prescott C	usa	University of Witwatersrand
Coulson	Ian M.	50	949	15	Joint Astronomy Centre	usa	South African Astronomical Observatory
Gupta	Inder J.	48	205	5	Ohio State University	usa	The Council for Scientific and Industrial Research

Three messages

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